

IN THE CLAIMS:

All of the pending claims 1-12 are set forth below, none of which are amended herein. New claim 13 has been added. The status of each claim is indicated with one of (original), (previously presented), or (new).

1. (previously presented) A simulation apparatus for simulating a receiving characteristic of any object that receives a radio wave transmitted from a radio wave generation source, comprising:

- a first current calculation device calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns;
- a current storage device storing the current values of the generation source;
- a second current calculation device calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage device as constants; and
- an output device calculating the receiving characteristic of the object based on the current values of the object and outputting the receiving characteristic of the object, and

wherein simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when the distance between the object and the source is greater than or equal to a threshold distance.

2. (original) The simulation apparatus according to claim 1, wherein said second current calculation device includes a device calculating mutual impedance between elements of the object, a device calculating mutual impedance between an element of the generation source and an element of the object and a matrix storage device storing matrix data of mutual impedance between elements of the object, calculates mutual impedance between an element of the generation source and an element of the object corresponding to a new position when a position of the generation source changes, generates simultaneous equations of the object corresponding to the new position using the matrix data stored in the matrix storage device as a coefficient matrix and calculates new current values.

3. (original) The simulation apparatus according to claim 2, wherein said second current calculation device further includes a factorization device factorizing the coefficient matrix by a prescribed factorization method and said matrix storage device stores matrix data of a factorized coefficient matrix.

4. (original) The simulation apparatus according to claim 1, further comprising a judging device judging whether a calculation method in which the current values of the generation source are regarded as constants can be used, wherein said second current calculation device calculates the current values of the object using the simultaneous equations of the object if the calculation method can be used.

5. (previously presented) A simulation apparatus for simulating a directivity characteristic of any object that receives a radio wave transmitted from a transmitting antenna, comprising:

- a first current calculation device calculating current values of the transmitting antenna using simultaneous equations of the transmitting antenna when the transmitting antenna is divided into a plurality of elements, the simultaneous equations of the transmitting antenna having currents that flow through respective elements as unknowns;

- a current storage device storing the current values of the transmitting antenna;

- a matrix storage device storing matrix data of mutual impedance between elements of the object when the object is divided into a plurality of elements;

- a device calculating mutual impedance between an element of the transmitting antenna and an element of the object for each angle of the transmitting antenna against the object;

- a second current calculation device generating simultaneous equations of the object for each angle of the transmitting antenna using currents that flow through respective elements of the object as unknowns, matrix data stored in the matrix storage device as a coefficient matrix and both the current values stored in the current storage device and the mutual impedance between the element of the transmitting antenna and the element of the object as constants, and calculating current values of the object; and

- an output device calculating the directivity characteristic of the object based on the current values of the object and outputting the directivity characteristic of the object, and

- wherein the simultaneous equations of the radio wave transmitted from the transmitting antenna and the simultaneous equations of the directivity characteristic of the object are separated by regarding the current values of the radio wave transmitted from the transmitting antenna as constants when a distance between the object and the source is greater than or

equal to a threshold distance, and the current values of the radio wave transmitted from the transmitting antenna and the current values of the directivity characteristic of the object are separately calculated when the distance between the object and the source is greater than or equal to a threshold distance.

6. (previously presented) A simulation apparatus for simulating a receiving characteristic of any object that receives a radio wave transmitted from a radio wave generation source, comprising:

an impedance storage device storing both data of mutual impedance between elements of the generation source when the generation source is divided into a plurality of elements and data of mutual impedance between elements of the object when the object is divided into a plurality of elements as data independent from a position of the generation source;

a device calculating mutual impedance between an element of the generation source and an element of the object corresponding to a new position when the position of the generation source changes;

a current calculation device calculating current values using simultaneous equations having currents that flow through respective elements of both the generation source and object as unknowns and having a matrix consisting of the data stored in the impedance storage device and the mutual impedance between the element of the generation source and the element of the object as a coefficient matrix; and

an output device calculating the receiving characteristic of the object based on the current values and outputting the receiving characteristic of the object, and

wherein the simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when the distance between the object and the source is greater than or equal to a threshold distance.

7. (previously presented) A computer-readable storage medium on which is recorded a program process for controlling and enabling a computer to simulate a receiving characteristic of any object that receives a radio wave transmitted from a radio wave generation source, said process comprising:

calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the

simultaneous equations of the generation source having currents that flow through respective elements as unknowns;

storing the current values of the generation source;

calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the stored current values as constants;

calculating the receiving characteristic of the object based on the current values of the object; and

outputting the receiving characteristic of the object, and

wherein the simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when the distance between the object and the source is greater than or equal to a threshold distance.

8. (previously presented) A process of simulating a receiving characteristic of any object that receives a radio wave transmitted from a radio wave generation source, said process comprising:

determining whether a distance between the object and the source is greater than or equal to a threshold distance;

calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns when the distance between the object and the source is greater than or equal to a threshold distance;

storing the current values of the generation source when the distance between the object and the source is greater than or equal to a threshold distance;

calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the stored current values as constants when the distance between the object and the source is greater than or equal to a threshold distance;

calculating the receiving characteristic of the object based on the current values of the object when the distance between the object and the source is greater than or equal to a threshold distance;

outputting the receiving characteristic of the object where the simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when the distance between the object and the source is greater than or equal to a threshold distance;

calculating mutual impedance between elements of the object, calculating mutual impedance between an element of the generation source and an element of the object with matrix data of mutual impedance between elements of the object when the distance between the object and the source is greater than or equal to a threshold distance;

calculating mutual impedance between an element of the generation source and an element of the object corresponding to a new position when a position of the generation source changes and when the distance between the object and the source is greater than or equal to a threshold distance; and

generating simultaneous equations of the object corresponding to the new position using the matrix data stored in a matrix storage device as a coefficient matrix and calculating new voltage values using stored current values and the simultaneous equations when the distance between the object and the source is greater than or equal to a threshold distance.

9. (previously presented) A method of simulating a receiving characteristic of any object that receives a radio wave transmitted from a radio wave generation source, comprising:

generating simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns;

calculating current values of the generation source using the simultaneous equations of the object;

preserving the current values of the generation source;

generating simultaneous equations of the object according to a position of the object when the object is divided into a plurality of elements, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the preserved current values as constants;

calculating current values of the object corresponding to the position of the object using the simultaneous equations of the object;

calculating the receiving characteristic of the object based on the current values of the object; and

outputting the receiving characteristic of the object on an output device, and

wherein the simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when the distance between the object and the source is greater than or equal to a threshold distance.

10. (previously presented) A simulation apparatus for simulating a receiving characteristic of any object that receives a radio wave transmitted from a radio wave generation source, comprising:

first current calculation means for calculating current values of the generation source using simultaneous equations of the generation source when the generation source is divided into a plurality of elements, the simultaneous equations of the generation source having currents that flow through respective elements as unknowns;

current storage means for storing the current values of the generation source;

second current calculation means for calculating current values of the object using simultaneous equations of the object when the object is divided into a plurality of elements and a positional relationship between the generation source and object changes, the simultaneous equations of the object having currents that flow through respective elements as unknowns and the current values stored in the current storage means as constants; and

output means for calculating the receiving characteristic of the object based on the current values of the object and outputting the receiving characteristic of the object, and

wherein the simultaneous equations of the radio wave generation source and the simultaneous equations of the receiving characteristic of the object are separated by regarding the current values of the radio wave generation source as constants when a distance between the object and the source is greater than or equal to a threshold distance, and the current values of the radio wave generation source and the current values of the receiving characteristic of the object are separately calculated when the distance between the object and the source is greater than or equal to a threshold distance.

11. (previously presented) A method of simulating a receiving characteristic of any object receiving a radio wave from a radio wave source using a computer, comprising:

determining whether a distance between the object and the source is greater than or equal to a threshold distance;

calculating current values of the source when the distance between the object and the source is greater than or equal to a threshold distance;

storing the current values as constants when the distance between the object and the source is greater than or equal to a threshold distance;

calculating current values of the object using the constants when the distance between the object and the source is greater than or equal to a threshold distance;

calculating the receiving characteristic of the object based on the current values of the object; and

outputting the receiving characteristic of the object on an output device when the distance between the object and the source is greater than or equal to a threshold distance.

12. (previously presented) A method of simulating a receiving characteristic of any object receiving a radio wave from a radio wave source using a computer, comprising:

determining whether a distance between the object and the source is greater than or equal to a threshold distance;

calculating current values of the source when the distance between the object and the source is greater than or equal to a threshold distance;

storing the current values as constants when the distance between the object and the source is greater than or equal to a threshold distance;

calculating current values of the object using the constants when the distance between the object and the source is greater than or equal to a threshold distance;

changing a relative position of the object and source when the distance between the object and the source is greater than or equal to a threshold distance;

calculating current values of the object with the changed relative position using the constants when the distance between the object and the source is greater than or equal to a threshold distance;

calculating the receiving characteristic of the object based on the current values of the object; and

outputting the receiving characteristic of the object on an output device when the distance between the object and the source is greater than or equal to a threshold distance.

13. (new) An apparatus for simulating a receiving characteristic of a receiving antenna that receives a radio wave transmitted from a transmitting antenna, comprising:

a first current calculation device calculating the current value of the transmitting antenna by solving a first set of simultaneous equations, each equation in the first set representing a current of each of a plurality of elements composing the transmitting antenna, and storing the representative current values;

a second current calculation device extracting the stored current values, when a relative position between the transmitting antenna and receiving antenna is changes, generating a second set of simultaneous equations, each equation in the second set representing a current of each of a plurality of elements composing the receiving antenna, calculating the current value of the receiving antenna by solving the second set of simultaneous equations, and outputting the values;

an output device receiving the output values from the second current calculation device and calculating the receiving characteristic of the receiving antenna using the output values and outputting the receiving characteristic, wherein

a coefficient matrix of the first set of simultaneous equations is composed of only mutual impedance between the elements of the transmitting antenna, and

a coefficient matrix of the second set of simultaneous equations is composed of only mutual impedance between the elements of the receiving antenna.